


Automated Pavement Crack Detection

RoadCrack

Contact: David Pratt
Roads & Traffic Authority of NSW
Australia
David_Pratt@rta.nsw.gov.au


Overview




- Importance of cracking in road pavements
- Background to RoadCrack development
- Capabilities & features
- Method of data capture
- Data reporting & presentation
- Future directions & developments

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Cracking In Road Pavements





- Australian pavements majority have thin surfacings
- RTA – 40,000 Lane-kms
 - Spray-seal - 70%
 - A/c - 24%
 - Concrete - 6%
- Water entering into cracks weakens the pavement
- Early detection is cost effective (< 1mm preferred)



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RoadCrack Technology

- Concept – in early 90s
- 1992 – RTA engaged CSIRO
- 1997 – 1 channel prototype
- 1999 – 2 channel 25% sampling
- 2001 – 4 channel 100% sampling



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RoadCrack Current System

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RoadCrack Technology Components

- Vehicle platform & power generation
- Image acquisition
(4 x line scan "cameras" – each 600mm width)
- Illumination (reflectors & quartz iodine lights)
- Real time image processing & analysis
(600mm x 500mm frame compiled & analysed)
- User interface & data reporting

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RoadCrack Performance



- **Highway Speed Operation**
- **All Types of Sealed Pavements**
- **2.4 m Survey Width**
- **Continuous Survey**
- **Classifies Crack Types**
- **Determines Crack Width (1mm detection threshold)**

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RoadCrack Equipment



- VOLVO truck
- Shaft encoder (distance measurement)
- 3 phase 240V generator
- Uninterruptible power supply (UPS)
- 4 image sensors ("cameras")
- 13 computers
- Graphical user interface (GUI)

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Vehicle Features



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Vehicle Features



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Capabilities



- **Continuous scanning** - 800 frames for 100m
- **Real time processing** – allows monitoring by operator
- **Classify cracks** - predominant type
- **Extent** (count of frames)
- **Severity** (average width)
- **Detection threshold** - width down to 1mm
- **Images not stored** – can capture sample images
- **Network or investigatory testing**
- **Data capture** - night or day

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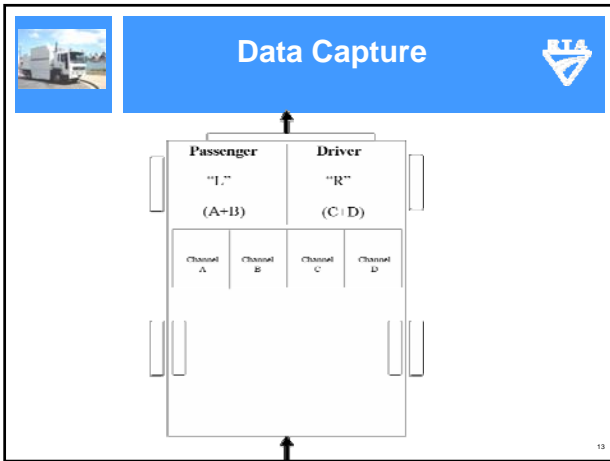


Data Quality



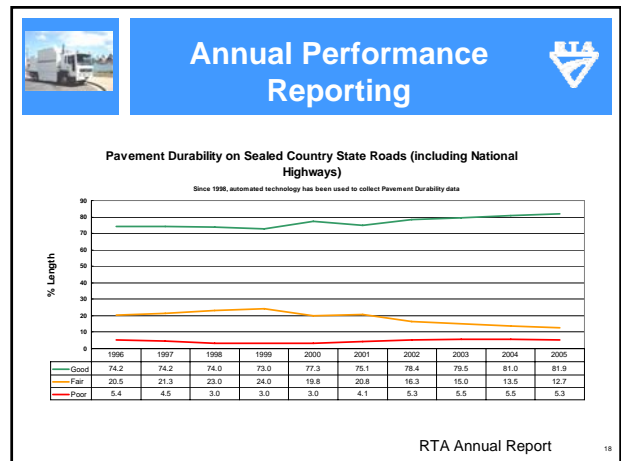
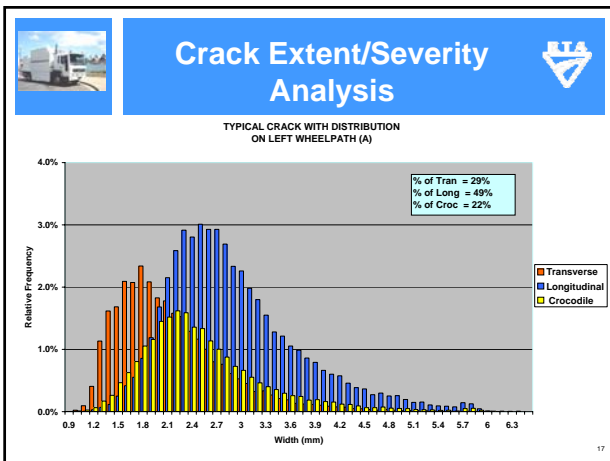
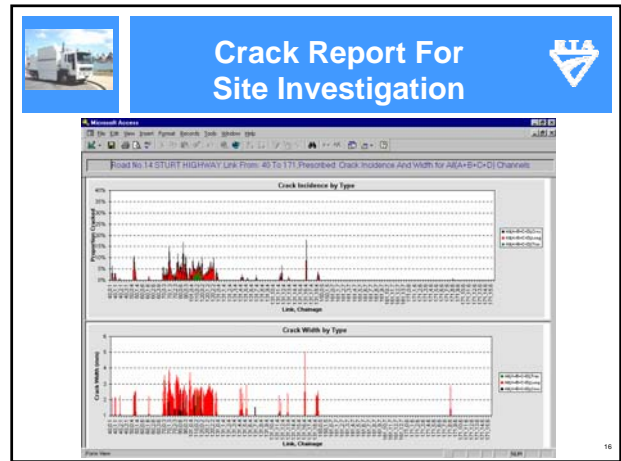
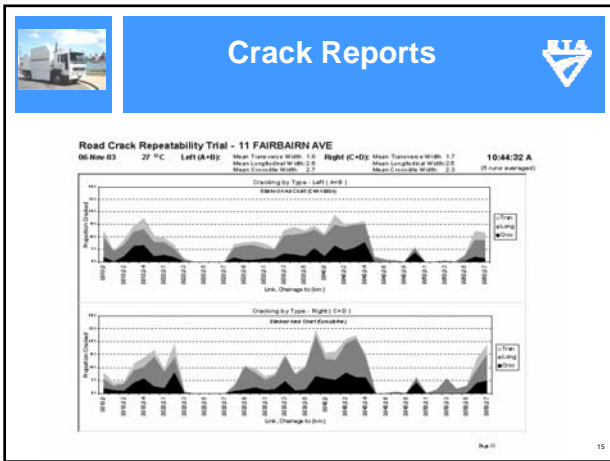
- **Location reference** (RoadLoc & GPS)
- **Distance calibration** (Regularly checked)
- **Image quality** (Sample images retained)
- **Repeatability trials** (Before & after each job)
- **Consistent annual survey plan** (of most trafficked lane)


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Network Survey Data Summary At 100 M

Road Location Reference				Road Temp	Comments	Percentage Area and Width of Crack by Type						
Road Num	Link Num	Chainage (km) From To	Transverse %			Longitudinal %	Crocodile %	Straight %	Avg Width	Avg Width	Avg Width	
373	0010	0.0 0.1	23		Start of Test	5.5	2.28	14.1	2.29	1.2	1.90	5.2
373	0010	0.1 0.2	23			0	0.00	35.5	2.38	8.1	2.05	0
373	0010	0.2 0.3	23			1.3	2.30	3.9	2.98	0	0.00	0
373	0010	0.3 0.4	23			1.7	1.90	16.1	2.11	3.0	2.20	1.1
373	0010	0.4 0.5	23			0	0.00	8.1	2.01	1.9	2.40	0
373	0010	0.5 0.6	23			3.2	1.78	6.9	2.48	1.2	2.20	1.6
373	0010	0.6 0.7	24			8.3	2.66	6.9	2.27	1.3	2.00	1.4
373	0010	0.7 0.8	24			10.9	2.12	8.2	1.84	8.4	1.92	1.4
373	0010	0.8 0.9	24			15.0	1.71	8.9	2.08	5.8	1.92	1.3
373	0010	0.9 1.0	24			8.5	2.04	20.6	1.98	2.9	1.75	0
373	0010	1.0 1.1	24			14.4	1.80	6.4	1.97	4.6	1.99	0
373	0010	1.1 1.2	24			8.7	1.96	10.1	2.09	6.9	1.99	1.7
373	0010	1.2 1.3	24			9.8	1.99	30.0	2.70	12.8	2.26	2.0
373	0010	1.3 1.4	25			13.2	2.05	26.8	2.42	11.3	2.11	2.1
373	0010	1.4 1.5	25			2.3	1.87	18.7	2.10	1.6	2.00	0





Summary




Benefits from Automation

- Objective, repeatable (measured vs estimated)
- Reduced cost & improved safety

Performance to suit needs


- Width detection threshold (1mm)
- Survey frequency & network sampling




Standards & Documents

- Defined data specifications & test method
- Validation & repeatability procedures
- Reporting (type, severity, extent – definitions & limits)

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RoadScan - The Next Phase -




Systems Combined on One Survey Vehicle

- Cracking – RoadCrack
- Profile – Roughness & Rutting (Scanning Laser)
- Strength – Deflection (at high speed) (Laser)
- Geometry – Terrain Model

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Summary



- World Class Performance
- Data Contributes to Asset Management (used in project selection)
- Routine operation since 1997 > 250,000 kms
- Spare Capacity - surveys for other States
- Commercial Opportunities (International Patent)
- Potential Integration of Technologies on same vehicle (Profilometer, High Speed Deflection?)

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